

CLAIMS

What is claimed is:

- 1 1. A diode laser assembly, comprising:
2 a substrate;
3 an epitaxial structure formed on the substrate;
4 a laser formed in the epitaxial structure; and
5 an amplifier formed in the epitaxial structure, at least a portion of the laser and
6 amplifier sharing a common waveguide.
- 1 2. The laser assembly of claim 1 wherein the common waveguide has non-
2 uniform optical properties along its centerline.
- 1 3 The laser assembly of claim 1 wherein the common waveguide has non-
2 uniform cross-sectional area along its centerline.
- 1 4. The laser assembly of claim 1 wherein the common waveguide has non-
2 uniform curvature along its centerline.
- 1 5. The laser assembly of claim 1 wherein the common waveguide has non-
2 uniform optical properties normal to its centerline.
- 1 6. The assembly of claim 1, wherein the amplifier includes at least one active
2 region and at least one passive region.
- 1 7. The assembly of claim 6, wherein the waveguide extends through an active
2 region and a passive region.
- 1 8. The assembly of claim 7, wherein a portion of the waveguide in the
2 amplifier is curved.
- 1 9. The assembly of claim 7, wherein at least a portion of the waveguide in a
2 passive region of the amplifier is curved.
- 1 10. The assembly of claim 7, wherein a portion of the waveguide in the
2 amplifier is curved and the amplifier includes a flared waveguide section.

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1 11. The assembly of claim 7, wherein an interface between the active region
2 and the passive region is oblique to a centerline of the waveguide.

1 12. The assembly of claim 7, wherein an interface between the active region
2 and the passive region is substantially normal to a centerline of the waveguide.

1 13. The assembly of claim 7, wherein an end of the waveguide in the amplifier
2 terminates at an oblique angle to an output facet.

1 14. The assembly of claim 6, wherein the waveguide includes a waveguide
2 mode adapter.

1 15. The assembly of claim 1, wherein at least a portion of the waveguide is
2 flared.

1 16. The assembly of claim 23, wherein a flared portion of the waveguide is in
2 an active region.

1 17. The assembly of claim 23, wherein a flared portion of the waveguide is in a
2 passive region.

1 18. The assembly of claim 1, wherein the waveguide includes an active section.

1 19. The assembly of claim 18, wherein the active section of the waveguide is
2 positioned in the first active section of the amplifier.

1 20. The assembly of claim 18, wherein the active section of the waveguide is
2 positioned in the second active section of the amplifier.

1 21. The assembly of claim 6, wherein the first active region has a oblique distal
2 face.

1 22. The assembly of claim 1, wherein the amplifier includes a plurality of
2 independently controllable active regions.

1 23. The assembly of claim 22, wherein a first and a second active region are
2 separated by a passive region.

24. The assembly of claim 23, wherein the first active region has a oblique distal face.

25. The assembly of claim 32, wherein the second active region has a oblique proximal face.

26. The assembly of claim 23, wherein the oblique distal face of the first active region is parallel to the oblique proximal face of the second active region.

27. The assembly of claim 23, wherein the second active region has a oblique distal face.

28. The assembly of claim 27, wherein the proximal face and the distal face of the second region are parallel.

29. The assembly of claim 1, wherein the epitaxial structure has areas of differing optical properties.

30. The assembly of claim 1, wherein the laser includes a mode selection element.

31. The assembly of claim 30, wherein the mode selection element is a controllable phase shifting element.

32. The assembly of claim 1, wherein the laser includes first and second reflectors and at least one of the first and second reflectors is tunable.

33. The assembly of claim 32, wherein at least one of the first and second reflectors is a distributed reflector.

34. The assembly of claim 32, wherein both of the first and second reflectors are distributed reflectors.

35. The assembly of claim 32, wherein at least one of the first and second reflectors is a distributed Bragg reflector.

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1 45. The assembly of claim 44, wherein the amplifier includes a first active
2 region and a passive region.

1 46. The assembly of claim 45, wherein the waveguide extends through at least
2 a portion of the amplifier.

1 47. The assembly of claim 66, wherein the waveguide extends through the first
2 active region and the passive region.

1 48. The assembly of claim 57, wherein a distal portion of the waveguide in the
2 amplifier is curved.

1 49. The assembly of claim 57, wherein a distal end of the waveguide in the
2 amplifier terminates at an oblique angle to an output facet.

1 50. The assembly of claim 66, wherein the waveguide includes a mode adapter.

1 51. The assembly of claim 44, wherein at least a portion of the waveguide is
2 flared.

1 52. The assembly of claim 44, wherein the waveguide includes an active
2 section.

1 53. The assembly of claim 52, wherein the active section of the waveguide is
2 positioned in the first active section of the amplifier.

1 54. The assembly of claim 52, wherein the active section of the waveguide is
2 positioned in the second active section of the amplifier.

1 55. The assembly of claim 45, wherein the first active region has an oblique
2 distal face.

1 56. The assembly of claim 45, wherein the amplifier includes a second active
2 region.

1 57. The assembly of claim 66, wherein the first and second active regions are
2 separated by a passive region.

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- 1 58. The assembly of claim 57, wherein the first active region has an oblique
2 distal face.
- 1 59. The assembly of claim 58, wherein the second active region has an oblique
2 proximal face.
- 1 60. The assembly of claim 59, wherein the oblique distal face of the first active
2 region is parallel to the oblique proximal face of the second active region.
- 1 61. The assembly of claim 59, wherein the second active region has an oblique
2 distal face.
- 1 62. The assembly of claim 61, wherein the proximal face and the distal face of
2 the second region are parallel.
- 1 63. The assembly of claim 44, wherein the epitaxial structure has areas of
2 differing optical properties.
- 1 64. The assembly of claim 44, wherein the laser includes a mode selection
2 element.
- 1 65. The assembly of claim 64, wherein the mode selection element is a
2 controllable phase shifting element.
- 1 66. The assembly of claim 44, wherein at least one of the first and second
2 reflectors is tunable.
- 1 67. The assembly of claim 66, wherein at least one of the first and second
2 reflectors is a distributed reflector.
- 1 68. The assembly of claim 66, wherein both of the first and second reflectors is
2 a distributed reflector.
- 1 69. The assembly of claim 66, wherein at least one of the first and second
2 reflectors is a distributed Bragg reflector.
- 1 70. The assembly of claim 66, wherein each of the first and second reflectors is
2 a distributed Bragg reflector.

1 71. The assembly of claim 66, wherein a maximum reflectivity of at least one
2 of the first and second reflectors is tunable.

1 72. The assembly of claim 66, wherein a maximum reflectivity of each of the
2 first and second reflectors is tunable.

1 73. The assembly of claim 66, wherein the maximum reflectivities of each of
2 the first and second reflectors are tunable relative to each other.

1 74. The assembly of claim 66, wherein the laser includes a controllable
2 amplifier positioned outside of the laser.

1 75. The assembly of claim 66, wherein the laser includes a controllable
2 attenuator positioned outside of the laser.

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- 1 76. The assembly of claim 66, wherein the laser includes an attenuator and at
2 least one amplifier positioned outside of the resonant cavity.

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